

AMENDMENTS TO THE SPECIFICATION

Please add the following to the end of the Specification.

[0040] In some embodiments, the invention is implemented as a computer program product for adaptive filtering a signal received over a channel subjected to multipath effects. In those embodiments, a computer-readable medium stores at least one program module. The program module determines filter coefficients  $\hat{c}$  such that

$$\hat{c} = E \left[ \hat{r} \hat{r}^H \right]^{-1} \hat{s}_{desired}, \quad (12)$$

where

$$\hat{c} = E \left[ \hat{r} \hat{r}^H \right]^{-1} \hat{s}_{desired}, \quad (13)$$

where  $\hat{r}$  is the received signal,  $\hat{s}_{desired}$  is the modified steering vector of the desired signal, and

$$\hat{s}_{desired} = \bar{s}_{desired} * \bar{h}, \quad (14)$$

where

$$\bar{h} = [h_1, h_2, \dots, h_L] \quad (15)$$

is a discrete time estimate of the effect of multipath on the channel and  $L$  is the delay spread of the channel for the estimate. In some embodiments, the steering vector of the desired signal is the spreading sequence of the desired signal in a code division multiple access communication system.

[0041] In further embodiments, a computer program product for adaptive filtering a signal in accordance with the present invention includes a computer-readable medium storing a program module that determines filter coefficients  $\hat{\hat{c}}$ , such that

$$\hat{\hat{c}} = E[\hat{\hat{r}}\hat{\hat{r}}^H]^{-1}\hat{\hat{s}}_{desired}, \quad (16)$$

where  $\hat{\hat{r}}$  is the received signal,  $\hat{\hat{s}}_{desired}$  is the modified steering vector of the desired signal, and

$$\hat{\hat{s}}_{desired} = \bar{s}_{desired} * \bar{h}, \quad (17)$$

where

$$\bar{h} = [h_1, h_2, \dots, h_L] \quad (18)$$

is a discrete time estimate of the effect of multipath on the channel and  $L$  is the delay spread of the channel for the estimate. In these embodiments, the steering vector of the desired signal is the spreading sequence of the desired signal in a code division multiple access communication system.

[0042] Computer program products of the present invention include a computer-readable medium storing at least one program module that modifies the steering vector. The modified steering vector is formed by the convolution of the steering vector with a vector estimating the effect of multipath on the observed signal. In a first analysis stage each data vector is projected onto the steering vector to form a set of inner products that estimate the part of the data that best corresponds to the steering vector. The inner products are multiplies onto the steering vector to form a set of vector estimates of that part of the data that best corresponds to the steering vector. These vector estimates are subtracted from the corresponding data vectors to obtain a projection of the data onto the nullspace of the steering vector.

[0043] In at least one adaptive analysis stage a correlation direction vector of the current adaptive stage is calculated between the corresponding inner products and vector differences of an immediately prior analysis stage. Inner products of the current stage are formed by projecting each vector difference of the immediately prior analysis stage onto the correlation direction vector of the current stage; scaled vectors of the current stage are formed by multiplying the inner products of the current stage onto the correlation direction vector of the current stage. The prior stage vector differences are projected onto the nullspace of the correlation direction vector of the current stage by subtracting each scaled vector of the current stage from the corresponding projection of the prior stage. The steering vector, in some of these embodiments, is the spreading code of a code division multiple access (CDMA) system.